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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/797,411	Applicant(s) KISELEWICH, STEPHEN J.	
	Examiner Sath V. Perungavoor	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Following is a quotation from MPEP 2106.IV.B.1(a) (emphasis added):

> **Data structures not claimed as embodied in computer-readable media are descriptive material per se and are not statutory because they are not capable of causing functional change in the computer.** See, e.g., Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory). Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure's functionality to be realized. In contrast, a claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory.

[1] Claims 16-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as set forth in MPEP 2106.IV.B.1(a). Adding the limitation of "stored on a computer-readable medium" after "computer program product" would resolve this issue.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

[2] Claims 1-26 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by Owechko et al. ("Owechko") [US 2003/0204384 A1].

[3] Claims 1-26 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Owechko.

Regarding claim 1, Owechko meets the claim limitations, as follows:

A method of object detection comprising the steps of *[Figure 3; Claim 1, Line 1]*: receiving images of an area occupied by at least one object *[300 on Figure 3; Paragraph 0049; Claim 1, Lines 3-4]*; extracting image features including wavelet features from the images *[304 on Figure 3; Paragraph 0049; Claim 1, Lines 6-7]*; and performing classification on the image features as a group in at least one common classification algorithm to produce object class confidence data *[314-316 on Figure 3; Paragraph 0049; Claim 1, Lines 9-10; Claim 2, Lines 1-3].*

Regarding claim 2, Owechko meets the claim limitations, as follows:

The method of claim 1, wherein the object class confidence data includes a detected object estimate *[320-324 on Figure 3; Paragraph 0049; Claim 1, Lines 12-13].*

Regarding claim 3, Owechko meets the claim limitations, as follows:

The method of claim 2, wherein the at least one object comprises a vehicle occupant and the area comprises a vehicle occupancy area, and further comprising a step of processing the detected object estimate to provide signals to vehicle systems *[Figure 7; Paragraph 0002; Claim 6, Lines 1-5].*

Regarding claim 4, Owechko meets the claim limitations, as follows:

The method of claim 3, wherein the signals comprise airbag enable and disable signals *[328 on Figure 3; Claim 7, Lines 1-2; Paragraph 0049].*

Regarding claim 5, Owechko meets the claim limitations, as follows:

The method of claim 4, wherein the method further comprises a step of capturing images from a sensor selected from a group consisting of CMOS vision sensors and CCD vision sensors *[Paragraph 0050; Claim 8, Lines 1-4]*.

Regarding claim 6, Owechko meets the claim limitations, as follows:

The method of claim 1, wherein the at least one common classification algorithm comprises a plurality of common classification algorithms *[Paragraph 0066; Claim 3, Lines 1-5]*.

Regarding claim 7, Owechko meets the claim limitations, as follows:

The method of claim 6, comprising the further step of performing a mathematical function (i.e. GM operator) on the object class confidence data (i.e. input values) from each of the common classification algorithms to thereby arrive at a detected object estimate *[Paragraph 0089]*.

Regarding claim 8, Owechko meets the claim limitations, as follows:

The method of claim 6, comprising the further step of averaging (i.e. mean) the object class confidence data from each of the common classification algorithms to thereby arrive at a detected object estimate *[Paragraph 0090]*.

Regarding claim 9, Owechko meets the claim limitations, as follows:

The method of claim 6, wherein each of the common classification algorithms has at least one different parameter value *[Paragraph 0087]*.

Regarding claim 10, Owechko meets the claim limitations, as follows:

The method of claim 1, wherein said at least one common classification algorithm is selected from the group consisting of a Feedforward Backpropagation Neural Network, a trained C5decision tree, a trained Nonlinear Discriminant Analysis network, and a trained Fuzzy Aggregation Network *[Paragraph 0066; Claim 3, Lines 1-5]*.

Regarding claim 11, Owechko meets the claim limitations, as follows:

The method of claim 1, wherein the step of extracting image features comprises the step of extracting wavelet coefficients of the images of the at least one object occupying an area *[304 on Figure 3; Paragraph 0057; Claim 4, Lines 1-5]*; and wherein the step of classifying the image features comprises processing the wavelet coefficients with said at least one common classification algorithm *[Paragraph 0059; Claim 4, Lines 5-8]*.

Regarding claim 12, Owechko meets the claim limitations, as follows:

The method of claim 1, wherein the step of extracting image features further comprises the steps of: detecting edges of the at least one object within the images *[306 on Figure 3; Paragraph 0062; Claim 9, Lines 4-5]*; masking the edges with a background mask to find important edges *[Paragraph 0063; Claim 9, Lines 7-8]*;

calculating edge pixels from the important edges *[Paragraph 0064; Claim 9, Line 10]*; and producing edge density maps from the important edges, the edge density map providing the image features, and wherein the step of classifying the image features comprises processing the edge density map with the at least one common classification algorithm *[Paragraph 0065; Claim 9, Lines 12-17]*.

Regarding claim 13, Owechko meets the claim limitations, as follows:

The method of claim 1, wherein the step of extracting image features further comprises the steps of *[Figure 8; Paragraph 0070; Claim 10, Lines 1-2]*: receiving a stereoscopic pair of images of an area occupied by at least one object *[800 on Figure 8; Claim 10, Lines 4-5]*; detecting pattern regions and non-pattern regions within each of the pair of images using a texture filter *[802 on Figure 8; Claim 10, Lines 7-8]*; generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images *[804 on Figure 8; Claim 10, Lines 9-11]*; using the initial estimate to generate a subsequent estimate of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using disparity constraints *[806 on Figure 8; Claim 10, Lines 13-17]*; iteratively using the subsequent estimate as the initial estimate in the step of using the initial estimate to generate a subsequent estimate in order to generate further subsequent estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities; and generating a disparity map of the area occupied by at least

one object from the final estimate of the spatial disparities *[808 on Figure 8; Claim 10, Lines 18-26]*, and wherein the step of performing classification on the image features comprises processing the disparity map with the at least one classification algorithm to produce object class confidence data *[804 on Figure 8; Claim 10, Lines 28-33]*.

Regarding claim 14, Owechko meets the claim limitations, as follows:

The method of claim 1, further comprising the steps of: detecting motion of the at least one object within the images *[Claim 11, Lines 4-5]*; calculating motion pixels from the motion *[Claim 11, Line 7]*; and producing motion density maps from the motion pixels, the motion density map providing the image features *[Claim 11, Lines 9-11]*; and wherein the step of classifying the image features comprises processing the motion density map with the at least one classification algorithm to produce object class confidence data *[Claim 11, Lines 13-18]*.

Regarding claim 15, Owechko meets the claim limitations, as follows:

The method of claim 1, wherein the receiving step comprises receiving a stereoscopic pair of images of an area occupied by at least one object, the extracting step including extracting image features from the images, with at least a portion of the image features being extracted by the steps of: detecting pattern regions and non-pattern regions within each of the pair of images using a texture filter; generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images; using the initial estimate to generate a subsequent estimate of the spatial disparities between the non-pattern regions based on the spatial disparities

between the pattern regions using disparity constraints; iteratively using the subsequent estimate as the initial estimate in the step of using the initial estimate to generate a subsequent estimate in order to generate further subsequent estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities; and generating a disparity map of the area occupied by at least one object from the final estimate of the spatial disparities *[Claim 10: For detailed explanation see claims 1-14].*

Regarding claim 16, Owechko meets the claim limitations, as follows:

A computer program product for object detection, the computer program product comprising means, stored on a computer readable medium, for: receiving images of an area occupied by at least one object; extracting image features including wavelet features from the images; and performing classification on the image features as a group in at least one common classification algorithm to produce object class confidence data *[Claim 55: For detailed explanation see claims 1-14].*

Regarding claim 17, Owechko meets the claim limitations, as follows:

A computer program product for object detection as set forth in claim 16, wherein the means for performing classification on the image features as a group comprises a means for processing the image features with at least one classification algorithm, said at least one common classification algorithm being selected from the group

consisting of a Feedforward Backpropagation Neural Network, a trained C5 decision tree, a trained Nonlinear Discriminant Analysis network, and a trained Fuzzy Aggregation Network *[Claim 57: For detailed explanation see claims 1-14]*.

Regarding claim 18, Owechko meets the claim limitations, as follows:

A computer program product for object detection as set forth in claim 16, wherein the means for extracting image features comprises a means for extracting wavelet coefficients of the at least one object in the images, and wherein the means for classifying the image features comprises a means for processing the wavelet coefficients with the at least one classification algorithm, at least one of the classification algorithms being selected from the group consisting of a Feedforward Backpropagation Neural Network, a trained C5 decision tree, a trained Nonlinear Discriminant Analysis network, and a trained Fuzzy Aggregation Network *[Claims 58 and 59: For detailed explanation see claims 1-14]*.

Regarding claim 19, Owechko meets the claim limitations, as follows:

A computer program product for object detection as set forth in claim 18, wherein the means for extracting image features further comprises means for: detecting edges of the at least one object within the images; masking the edges with a background mask to find important edges; calculating edge pixels from the important edges; and producing edge density maps from the important edges, the edge density map providing the image features, and wherein the means for classifying the image features processes the edge density map with the at least one classification algorithm

to produce object class confidence data *[Claim 63: For detailed explanation see claims 1-14]*.

Regarding claim 20, Owechko meets the claim limitations, as follows:

A computer program product for object detection as set forth in claim 19, wherein the means for extracting image features further comprises means for: receiving a stereoscopic pair of images of an area occupied by at least one object; detecting pattern regions and non-pattern regions within each of the pair of images using a texture filter; generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images; using the initial estimate to generate a subsequent estimate of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using disparity constraints; iteratively using the subsequent estimate as the initial estimate in the means for using the initial estimate to generate a subsequent estimate in order to generate further subsequent estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities; and generating a disparity map of the area occupied by at least one object from the final estimate of the spatial disparities, and wherein the means for classifying the image features processes the disparity map with the at least one classification algorithm to produce object class confidence data *[Claim 64: For detailed explanation see claims 1-14]*.

Regarding claim 21, Owechko meets the claim limitations, as follows:

An apparatus for object detection comprising a computer system including a processor, a memory coupled with the processor, an input coupled with the processor for receiving images, and an output coupled with the processor for outputting information based on an object estimation, wherein the computer system further comprises means, residing in its processor and memory, for: receiving images of an area occupied by at least one object; extracting image features including wavelet features from the images; and performing classification on the image features as a group in at least one common classification algorithm to produce object class confidence data *[Claim 109: For detailed explanation see claims 1-14]*.

Regarding claim 22, Owechko meets the claim limitations, as follows:

An apparatus for object detection as set forth in claim 21, wherein the means for classifying image features comprises a means for processing the image features with the at least one classification algorithm, the at least one classification algorithm being selected from the group consisting of a Feedforward Backpropagation Neural Network, a trained C5 decision tree, a trained Nonlinear Discriminant Analysis network, and a trained Fuzzy Aggregation Network *[Claim 111: For detailed explanation see claims 1-14]*.

Regarding claim 23, Owechko meets the claim limitations, as follows:

An apparatus for object detection as set forth in claim 21, wherein means for extracting image features comprises a means for: extracting wavelet coefficients of

the at least one object in the images; and wherein the means for classifying the image features comprises processing the wavelet coefficients with the at least one classification algorithm to produce object class confidence data, the at least one classification algorithm being selected from the group consisting of a Feedforward Backpropagation Neural Network, a trained C5 decision tree, a trained Nonlinear Discriminant Analysis network, and a trained Fuzzy Aggregation Network *[Claims 112 and 113: For detailed explanation see claims 1-14]*.

Regarding claim 24, Owechko meets the claim limitations, as follows:

An apparatus for object detection as set forth in claim 23, wherein the means for extracting image features further comprises means for: detecting edges of the at least one object within the images; masking the edges with a background mask to find important edges; calculating edge pixels from the important edges; and producing edge density maps from the important edges, the edge density map providing the image features; wherein the means for classifying the image features processes the edge density map with at least one of the classification algorithms to produce object class confidence data; and wherein the means for extracting image features further comprises means for: receiving a stereoscopic pair of images of an area occupied by at least one object; detecting pattern regions and non-pattern regions within each of the pair of images using a texture filter; generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images; using the initial estimate to generate a subsequent estimate of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions

using disparity constraints; iteratively using the subsequent estimate as the initial estimate in the means for using the initial estimate to generate a subsequent estimate in order to generate further subsequent estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities; and generating a disparity map of the area occupied by at least one object from the final estimate of the spatial disparities, and wherein the means for classifying the image features processes the disparity map with the at least one classification algorithm to produce object class confidence data *[Claims 117 and 118: For detailed explanation see claims 1-14]*.

Regarding claim 25, Owechko meets the claim limitations, as follows:

An apparatus for object detection as set forth in claim 23, wherein the means for extracting image features further comprises means for: receiving a stereoscopic pair of images of an area occupied by at least one object; detecting pattern regions and non-pattern regions within each of the pair of images using a texture filter; generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images; using the initial estimate to generate a subsequent estimate of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using disparity constraints; iteratively using the subsequent estimate as the initial estimate in the means for using the initial estimate to generate a subsequent estimate in order to generate further subsequent

estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities; and generating a disparity map of the area occupied by at least one object from the final estimate of the spatial disparities, and wherein the means for classifying the image features processes the disparity map with the at least one classification algorithm to produce object class confidence data *[Claim 118: For detailed explanation see claims 1-14]*.

Regarding claim 26, Owechko meets the claim limitations, as follows:

An apparatus for object detection as set forth in claim 21, wherein the computer system further comprises means, residing in its processor and memory, for: receiving a stereoscopic pair of images of an area occupied by at least one object; extracting image features from the images, with at least a portion of the image features being extracted by means for: detecting pattern regions and non-pattern regions within each of the pair of images using a texture filter; generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images,; using the initial estimate to generate a subsequent estimate of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using disparity constraints; iteratively using the subsequent estimate as the initial estimate in the means for using the initial estimate to generate a subsequent estimate in order to generate further subsequent estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern

regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities; and generating a disparity map of the area occupied by at least one object from the final estimate of the spatial disparities; and performing classification on the image features as a group in at least one common classification algorithm to produce object class confidence data, with at least a portion of the classifying being performed by processing the disparity map with the at least one classification algorithm to produce object class confidence data *[Claim 118: For detailed explanation see claims 1-14]*.

[4] Claims 1, 2, 6, 7, 9, 11, 16 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by <u>Peele</u> et al. [US 5,561,431] ("Peele").

Regarding claim 1, Peele meets all the claim limitations, as follows:

A method of object detection comprising the steps of *[Figure 4]*: receiving images (i.e. 401) of an area occupied by at least one object *[Column 8, Lines 30-31]*; extracting image features (403, 405) including wavelet features from the images *[Column 8, 36-42]*; and performing classification on the image features (407, 409) as a group in at least one common classification algorithm to produce object class confidence data *[Column 8, Lines 53-56]*.

Regarding claim 2, Peele meets all the claim limitations, as follows:

The method of claim 1, wherein the object class confidence data includes a detected object estimate *[Column 3, Lines 16-19]*.

Regarding claim 6, Peele meets all the claim limitations, as follows:

The method of claim 1, wherein the at least one common classification algorithm comprises a plurality (407,409) of common classification algorithms *[Column 8, Lines 53-56]*.

Regarding claim 7, Peele meets all the claim limitations, as follows:

The method of claim 6, comprising the further step of performing a mathematical function (i.e. highest value) on the object class confidence data from each of the common classification algorithms to thereby arrive at a detected object estimate *[Column 7, Lines 64-67]*.

Regarding claim 9, Peele meets all the claim limitations, as follows:

The method of claim 6, wherein each of the common classification algorithms has at least one different parameter value (i.e. independently determined) *[Column 8, Lines 53-56]*.

Regarding claim 11, Peele meets all the claim limitations, as follows:

The method of claim 1, wherein the step of extracting image features comprises the step of extracting wavelet coefficients of the images of the at least one object occupying an area *[Column 8, Lines 36--42]*; and wherein the step of classifying the image features comprises processing the wavelet coefficients with said at least one classification algorithm *[Column 8, Lines 53-56]*.

Regarding claims 16 and 21 all claimed limitations are set forth and rejected as per discussion for claim 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

[5] Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Peele in view of Dyckhoff et al. ("Dyckhoff") [NPL document titled, "Generalized Means as Model of Compensative Connectives"].

Regarding claim 8, Peele discloses the claim limitations as set forth in claim 6.

Peele does not explicitly disclose the following claim limitations:

> The method of claim 6, comprising the further step of averaging the object class confidence data from each of the common classification algorithms to thereby arrive at a detected object estimate.

However, in the same field of endeavor Dyckhoff discloses the deficient claim limitations, as follows:

> The method of claim 6, comprising the further step of averaging (i.e. generalized mean) the object class confidence data from each of the common classification algorithms to thereby arrive at a detected object estimate *[Page 145, Paragraph 2]*.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify the teachings of Peele with Dyckhoff to incorporate generalized mean, the motivation being to allow for modeling the degree of compensation *[Abstract]*.

[6] Claims 1-5, 10, 11, 14, 16-18 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klomark [NPL document titled, "Occupant Detection using Computer Vision"] in view of Papageorgiou et al. ("Papageorgiou") [NPL document titled, "Trainable Pedestrian Detection"].

Regarding claim 1, Klomark discloses the following claim limitations:

> A method of object detection comprising the steps of *[Page 6, Paragraph 1]*: receiving images of an area occupied by at least one object *[Page 6, Paragraph 1; Figure 1.5]*; extracting image features from the images *[Page 11, Paragraph 1]*; performing classification on the image features as a group in at least one common classification algorithm to produce object class confidence data *[Page 21, Paragraph 1]*.

Klomark does not explicitly disclose the following claim limitations (emphasis added):

> extracting image features including wavelet features from the images;

However, in the same field of endeavor Papageorgiou discloses the deficient claim limitations, as follows:

> extracting image features including wavelet features from the images *[Page 36, Column 2, Paragraph 1]*;

Klomark and Papageorgiou are combinable because they are from the same field object detection in automotive vision systems.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify the teachings of Klomark with Papageorgiou to include wavelet features, the motivation being to identify important characteristics and avoid noise in object detection *[Page 35, Column 1, Paragraph 3]*.

Regarding claim 2, Klomark meets the claim limitations, as follows:

The method of claim 1, wherein the object class confidence data includes a detected object estimate *[Page 6, Paragraph 1: RFBS]*.

Regarding claim 3, Klomark meets the claim limitations, as follows:

The method of claim 2, where the at least one object comprises a vehicle occupant and the area comprises a vehicle occupancy area *[Page 6, Figure 1.5]*, and further comprising a step of processing the detected object estimate to provide signals to vehicle systems *[Page 5, Paragraph 1]*.

Regarding claim 4, Klomark meets the claim limitations, as follows:

The method of claim 3, wherein the signals comprise airbag enable and disable signals *[Page 5, Paragraph 1]*.

Regarding claim 5, Klomark meets the claim limitations, as follows:

The method of claim 4, wherein the method further comprises a step of capturing images from a sensor selected from a group consisting of CMOS vision sensors and CCD vision sensors *[Page 9, Paragraph 1; Figure 1.8]*.

Regarding claim 10, Klomark meets the claim limitations, as follows:

The method of claim 1, wherein said at least one common classification algorithm is selected from the group consisting of a Feedforward Backpropogation Neural Network, a trained C5 decision tree, a trained Nonlinear Discriminant Analysis network, and a trained Fuzzy Aggregation Network *[Page 55, Paragraph 2; Further fuzzy aggregation network (FAN) is notoriously well known to be used in image classification. See Mirhosseini et al. NPL document titled, "Human Face Recognition: A Minimal Evidence Approach".]*.

Regarding claim 11, Papageorgiou meets the claim limitations, as follows:

The method of claim 1, wherein the step of extracting image features comprises the step of: extracting wavelet coefficients of the at least one object occupying an area of the images *[Page 36, Column 2, Paragraph 1]*; and wherein the step of classifying the image features comprises processing the wavelet coefficients with at least one common classification algorithm *[Page 36, Column 2, Paragraphs 4 and 5]*.

Regarding claim 14, Klomark meets the claim limitations, as follows:

The method of claim 1, further comprising the steps of: detecting motion of the at least one object within the images *[Page 31, Paragraph 1]*; calculating motion pixels from the motion *[Page 31, Paragraph 1]*; and producing motion density maps from the motion pixels, the motion density map providing the image features *[Page 31, Figure 4.3]*; and wherein the step of classifying the image features comprises processing the

motion density map with at least one of the classification algorithms to produce object class confidence data (movement or no movement)*[Page 33, Paragraph 1]*.

Regarding claims 16, 17, 18, 21, 22, 23, , all claimed limitations are set forth and rejected as per discussion for claim 1, 10, 11.

[7] Claims 12 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klomark in view of Papageorgiou further in view of Mengko et al. (hereinafter "Mengko") [NPL document titled, "Design and Implementation of Object Detection and Classification System Based on Deformation Template Algorithm"].

Regarding claim 12, Klomark and Papageorgiou meet the claim limitations as disclosed in the discussion for claim 1.

Klomark and Papageorgiou do not explicitly disclose the following claim limitations:

The method of claim 1, wherein the step of extracting image features further comprises the steps of: detecting edges of the at least one object within the image; masking the edges with a background mask to find important edges; calculating edge pixels from the important edges; and producing edge density maps from the important edges, the edge density map providing the image features, and wherein the step of classifying the image features comprises processing the edge density map with at least one common classification algorithm.

However, in the same field of endeavor Mengko discloses the deficient claim limitations, as follows:

The method of claim 4, wherein the step of extracting image features further comprises the steps of: detecting edges of the at least one object within the image *[Page 312, Column 2, Paragraph 3]*; masking the edges with a background mask to find important edges *[Page 312, Column 2, Paragraph 5]*; calculating edge pixels from the important edges *[Page 312, Column 2, Paragraph 3: Canny edge detection produces magnitude (i.e. edge density) and gradient.]*; and producing edge density maps from the important edges, the edge density map providing the image features, and wherein the step of classifying the image features comprises processing the edge density map with at least one common classification algorithms *[Page 312, Column 2, Paragraph 3; Page 313, Column 2, Paragraph 2: Canny edge detection produces magnitude (i.e. edge density) and gradient.]*.

Klomark, Papageorgiou and Mengko are combinable because they are from the same field or problem solving area of object detection and classification.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify the teachings of Klomark and Papageorgiou with Mengko to include edge based occupant classification, the motivation being robustness to noise and changes in intensity *[Mengko: Page 311, Column 2, Paragraph 1]*.

Regarding claim 19, all claimed limitations are set forth and rejected as per discussion for claim 12.

[8] Claims 13, 15, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over <u>Klomark</u> in view of <u>Papageorgiou</u> further in view of <u>Konrad</u> et al. ("Konrad") [NPL document titled, "Dense Disparity Estimation from Feature Correspondences"].

Regarding claim 13, Klomark discloses the following claim limitations:

> The method of claim 1, wherein the step of extracting image features further comprises the steps of: receiving a stereoscopic pair of images of an area occupied by at least one object *[Page 17, Figure 3.2}*; detecting feature regions and non-feature regions within each of the pair of images *[Page 18, Paragraph 1]*; generating a disparity map of the area occupied by at least one object from the final estimate of the spatial disparities *[Figure 3.2: disparity]*, and wherein the step of classifying the image features comprises processing the disparity map with at least one of the classification algorithms to produce object class confidence data *[Page 21, Paragraph 1; Figure 3.5, 3.6]*.

Klomark and Papageorgiou do not explicitly disclose the following claim limitations:

> detecting pattern regions and non-pattern regions within each of the pair of images using a texture filter; generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images; using the initial estimate to generate a subsequent estimate of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using disparity constraints; iteratively using the subsequent estimate as the initial estimate in the step of using the initial estimate to generate a subsequent estimate in order to generate further subsequent estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities;

However, in the same field of endeavor Konrad discloses the deficient claim limitations, as follows:

> detecting pattern regions and non-pattern regions within each of the pair of images using a texture filter *[Page 4, Paragraph 4]*; generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images *[Page 4, Paragraph 5; Page 6, Paragraph 3: sparse disparities]*; using the initial estimate to generate a subsequent estimate of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using disparity constraints *[Page 8, Paragraph 1]*; iteratively using the subsequent estimate as the initial estimate in the step of using the initial estimate to generate a subsequent estimate in order to generate further subsequent estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities *[Page 6, Paragraph 3]*;

Klomark, Papageorgiou and Konrad are combinable because they are from the same field or problem solving area of object detection.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify the teachings of Klomark and Papageorgiou with Konrad to incorporate texture feature constrained dense disparity estimation, the motivation being combine the range robustness of feature-based correspondence methods with resolution of dense methods *[Page 2, Paragraph 9]*.

Regarding claims 15 and 26, all claimed limitations are set forth and rejected as per discussion for claim 13.

Regarding claim 25, all claimed limitations are set forth and rejected as per discussion for claims 10, 11 and 13.

[9] Claims 20 and 24are rejected under 35 U.S.C. 103(a) as being unpatentable over Klomark in view of Papageorgiou further in view of Mengko further in view of Konrad.

Regarding claim 20, Klomark discloses the following claim limitations:

> A computer program product for object detection as set forth in claim 19, wherein the means of extracting image features further comprises the means of: receiving a stereoscopic pair of images of an area occupied by at least one object *[Page 17, Figure 3.2*}; detecting feature regions and non-feature regions within each of the pair of images *[Page 18, Paragraph 1]*; generating a disparity map of the area occupied by at least one object from the final estimate of the spatial disparities *[Figure 3.2: disparity]*, and wherein the step of classifying the image features comprises processing the disparity map with at least one of the classification algorithms to produce object class confidence data *[Page 21, Paragraph 1; Figure 3.5, 3.6]*.

Klomark, Papageorgiou and Mengko do not explicitly disclose the following claim limitations:

> generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images; using the initial estimate to generate a subsequent

estimate of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using disparity constraints; iteratively using the subsequent estimate as the initial estimate in the step of using the initial estimate to generate a subsequent estimate in order to generate further subsequent estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities;

However, in the same field of endeavor Konrad discloses the deficient claim limitations, as follows:

detecting pattern regions and non-pattern regions within each of the pair of images using a texture filter *[Page 4, Paragraph 4]*; generating an initial estimate of spatial disparities between the pattern regions within each of the pair of images *[Page 4, Paragraph 5; Page 6, Paragraph 3: sparse disparities]*; using the initial estimate to generate a subsequent estimate of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using disparity constraints *[Page 8, Paragraph 1]*; iteratively using the subsequent estimate as the initial estimate in the step of using the initial estimate to generate a subsequent estimate in order to generate further subsequent estimates of the spatial disparities between the non-pattern regions based on the spatial disparities between the pattern regions using the disparity constraints until there is no change between the results of subsequent iterations, thereby generating a final estimate of the spatial disparities *[Page 6, Paragraph 3]*;

Klomark, Papageorgiou, Mengko and Konrad are combinable because they are from the same field or problem solving area of object detection.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify the teachings of Klomark, Papageorgiou and Mengko with Konrad to incorporate texture feature constrained dense disparity estimation, the motivation being combine the range robustness of feature-based correspondence methods with resolution of dense methods *[Page 2, Paragraph 9]*.

Regarding claim 24, all claimed limitations are set forth and rejected as per discussion for claim 20.

Contact Information

[10] Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Sath V. Perungavoor whose telephone number is (571) 272-7455. The examiner can normally be reached on Monday to Friday from 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Bhavesh M. Mehta whose telephone number is (571) 272-7453, can be reached on Monday to Friday from 9:00am to 5:00pm. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Dated: August 23, 2006

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